Published in final edited form as:
J Psychiatr Res. 2011 July ; 45(7): 942–948. doi:10.1016/j.jpsychires.2011.05.003.

Trauma, Dissociation, and Antiretroviral Adherence among Persons Living with HIV/AIDS

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Abstract

Background—There are approximately 1,000,000 persons living with HIV/AIDS (PLH) in the United States; to reduce rates of new infection and curb disease progression, adherence to HIV medication among PLH is critical. Despite elevated trauma rates in PLH, no studies to date have investigated the relationship between dissociation, a specific symptom of trauma, and HIV medication adherence. We hypothesized that Post-Traumatic Stress Disorder (PTSD) symptoms would be associated with lower adherence, and that dissociation would moderate this relationship.

Methods—Forty-three individuals with HIV were recruited from community-based clinics to participate in a cross-sectional study. The relationship of trauma, dissociation, and their interaction to the probability of antiretroviral adherence was assessed using a hierarchical binary logistic regression analysis.

Results—Among 38 eligible participants, greater PTSD was associated with lower odds of adherence (OR = .92, $p < .05$). Dissociation moderated the effect of PTSD on adherence, resulting in lower odds of adherence (OR = .95, $p < .05$). PTSD symptoms were significantly associated with lower odds of adherence in individuals reporting high levels of dissociation (OR = .86, $p < .05$) but not in those reporting low levels of dissociation (OR = 1.02, $p > .05$).

Conclusions—This is the first study to demonstrate a relationship between dissociation and medication adherence. Findings are discussed in the context of clinical management of PLH with trauma histories and the need for interventions targeting dissociative symptomatology to optimize adherence.

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Contributors

Alex S. Keuroghlian designed the study, managed the literature searches, wrote the protocol, developed the survey questionnaire, wrote the first draft of the manuscript and oversaw subsequent revisions of the manuscript. Alex S. Keuroghlian, Cheryl Gore-Felton and Charles S. Kamen undertook subsequent revisions of the manuscript. Eric Neri encoded the audio computer assisted self interview survey. Charles S. Kamen, Eric Neri and Alex S. Keuroghlian undertook the statistical analyses. Susanne Lee contributed significantly to the design of the study, developed audio files for the computer-assisted self survey and oversaw logistical aspects of recruitment and assessment of patients. Rhianon Liu contributed significantly to the design of the study. The study was conducted in Cheryl Gore-Felton's laboratory: she contributed significantly to the design of the study, the statistical analyses, and the writing of the manuscript. All authors contributed to and have approved the final manuscript.

Keywords

dissociation; posttraumatic stress disorder; depression; HIV/AIDS; adherence; medication

Introduction

There are estimated to be over 1,000,000 persons living with HIV/AIDS in the United States and approximately 55,000 new HIV infections every year (Center for Disease Control and Prevention, 2010). With the development of highly active antiretroviral therapy (HAART), the number of persons living with HIV (PLH) continues to increase. Adherence to a HAART regimen, defined as correspondence between the behavior of a patient and the health care recommendations received (Haynes, Sackett, & Taylor, 1980), has the potential to decrease HIV-1 RNA (viral load), increase immune function, and enhance quality of life (Hammer et al., 2006). By contrast, inconsistent adherence to antiretroviral regimens is correlated with elevated viral load and decreased CD4 cell count (Paterson et al., 2000), as well as increased HIV-related morbidity (Roca, Gomez, & Arnedo, 2000) and mortality (Jensen-Fangel et al., 2004).

HAART regimens have low tolerance of nonadherence such that optimal viral suppression requires correct use of HAART 90 to 95% of the time (Paterson et al., 2000). Moreover, nonadherence to antiretroviral medications may increase viral resistance to numerous classes of medications, thereby rendering various medication options ineffective (Bangsberg, Moss, & Deeks, 2004). This is problematic because increased transmission of resistant HIV strains raises a variety of public health concerns (Wainberg & Friedland, 1998), including increased morbidity and mortality rates. Thus, it is critical to identify individuals living with HIV/AIDS who are likely to be non-adherent so that they can receive targeted interventions designed to increase adherence to HAART.

Adherence to antiretroviral therapy is a problem for many HIV-positive individuals, with an estimated 50% to 80% of PLH unable to practice adequate adherence (Belzer, Fuchs, Luftman, & Tucker, 1999; Johnson et al., 2003; Spire et al., 2002). The reasons for nonadherence are varied. Adherence to antiretroviral regimens is logistically challenging, as the therapy often consists of three or four separate medications. If first-line or second-line treatments have been ineffective, the patient may be expected to take over twenty pills each day while following a strict diet (Berg, Michelson, & Safren, 2007). Additionally, side effects of HAART include nausea, vomiting, anemia, and peripheral neuropathy, which can contribute to nonadherence (Ammassari et al., 2001). Furthermore, a variety of patient-related psychosocial factors have been associated with poor HAART adherence (Vervoort, Borleffs, Hoepelman, & Grypdonck, 2007), including low patient self-efficacy, psychological distress, depression, exposure to trauma, forgetfulness, substance use disorders, low social support from family and friends, inadequate confidence in treatment effectiveness, and poor understanding of the relationship between nonadherence and viral resistance (Ammassari et al., 2002; Deschamps et al., 2004; Leserman, 2008). Moreover, depression has been associated with disease progression among PLH (Leserman, 2008). Although the mechanism by which psychosocial factors result in nonadherence is not fully known, there is evidence that the occurrence of psychological symptoms of distress is associated with disease progression through a decrease in adherence among PLH (Gore-Felton & Koopman, 2008).

Posttraumatic Stress Disorder in Persons Living With HIV

High rates of trauma exist among both women and men living with HIV (Brief et al., 2004; Gore-Felton, Koopman, Bridges, Thoresen, & Spiegel, 2002). Studies have shown a 33%

lifetime prevalence of physical assault and 30% to 68% lifetime prevalence of sexual assault among HIV-positive individuals, versus 6.9% and 9.2% in the general population, respectively (Kalichman, Sikkema, DiFonzo, Luke, & Austin, 2002; Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995; Kimerling et al., 1999b). A study among 242 primarily African American gay or bisexual HIV-positive men found that 35% of the sample had a history of sexual assault (Kalichman et al., 2002). This is considerably higher than rates reported in the general population, in which 1% of men report a lifetime history of rape and 2.8% report past molestation (Kessler et al., 1995). Similarly, PLH have higher rates of childhood physical and sexual abuse compared to the general population (Brief et al., 2004). The psychological sequelae of trauma experiences have been well documented and often result in acute or chronic anxiety symptoms (Gore-Felton, 1999b).

According to the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (APA, 2000), post-traumatic stress disorder (PTSD) is an anxiety disorder that can occur after an individual witnesses or experiences a traumatic event involving the threat of injury or death. The hallmark symptoms of PTSD include re-experiencing, avoidance/numbing, and hyperarousal (APA, 2000).

PTSD is a debilitating disorder that is prevalent at greater rates among PLH than in the general population; furthermore, it has been shown to negatively impact HIV-related health outcomes (Kimerling, Armistead, & Forehand, 1999a; Kimerling et al., 1999b). A study among HIV-positive women found that more than one-third (35%) reported a history of trauma and currently met criteria for PTSD diagnosis (Kimerling et al., 1999b). In contrast, the lifetime prevalence of PTSD among women in the general population is 9.7% (Kessler et al., 2005). A similar finding among HIV-positive gay and bisexual men showed that 36% met criteria for PTSD (Kelly, Otto-Salaj, Sikkema, Pinkerton, & Bloom, 1998b), whereas 3.6% of men in the general population have a lifetime history of PTSD diagnosis (Kessler et al., 2005). Additionally, the diagnosis of HIV itself can be a traumatic stressor. In fact, 32% of HIV-positive men meet criteria for PTSD as a result of being diagnosed with HIV (Kelly et al., 1998a). This is higher than the rates of PTSD following diagnosis of other life-threatening illnesses: for example, only 5% of patients meet PTSD criteria after being diagnosed with breast cancer (Andrykowski & Cordova, 1998). Among persons living with hepatitis C, a population whose psychosocial profile is similar to that of PLH, the estimated prevalence of PTSD is 19% to 33.5% (Lehman & Cheung, 2002; El-Serag et al., 2002; Yovtcheva et al., 2001). One study showed a PTSD prevalence of 33.5% among veterans diagnosed with hepatitis C versus 24.5% among uninfected veterans (El-Serag et al., 2002). The increased rate of PTSD following a positive HIV diagnosis may combine with the already higher rate of traumatic experiences found in PLH, resulting in a cumulative stress effect. More research is needed to understand the increased psychiatric morbidity found among PLH who also report a trauma history.

Posttraumatic Stress Disorder, Dissociation, and Antiretroviral Adherence

In addition to their general negative impact on health outcomes, there is a growing body of evidence suggesting that symptoms of traumatic stress are associated with antiretroviral nonadherence. A positive correlation exists between depression and nonadherence to antiretrovirals (Ammassari et al., 2004), and PLH with past trauma report more depressive symptoms than PLH with no history of trauma (Kalichman et al., 2002). Also, emotional distress has been shown to increase nonadherence to antiretrovirals (Singh et al., 1996), and PLH with a history of trauma report greater distress than PLH with no past trauma (Kimerling et al., 1999a).

More than half of patients living with HIV who report inconsistent adherence to HAART regimens meet diagnostic criteria for PTSD (Safren, Gershuny, & Hendriksen, 2003).

Although several studies have reported an association between PTSD and antiretroviral nonadherence (Boarts, Sledjeski, Bogart, & Delahanty, 2006; Cohen, Alfonso, Hoffman, Milau, & Carrera, 2001; Safren et al., 2003; Whetten, Reif, Whetten, & Murphy-McMillan, 2008), it has not always been clear whether it is PTSD alone or in fact comorbid depression that drives this relationship (Boarts et al., 2006; Delahanty, Bogart, & Figler, 2004; Sledjeski, Delahanty, & Bogart, 2005; Vranceanu et al., 2008). Additionally, the relationship of specific symptoms of PTSD to HAART nonadherence has yet to be clarified.

Dissociative symptoms are a common but little-understood response to trauma. Dissociation is defined as a disruption or breakdown of memory, awareness, identity and/or perception. It can develop following long-term physical, sexual or psychological abuse (Vermetten, Dorahy, & Spiegel, 2007), or following an acute life stressor (Morgan et al., 2001). A dissociative coping style in the face of an inescapable traumatic experience may prevent subsequent cognitive and emotional processing of the pain associated with the trauma (Spiegel, 1997; Spiegel & Cardena, 1991); in fact, acute dissociative responses to psychological trauma increase the risk of developing chronic dissociation and chronic PTSD (Bremner et al., 1992; Butler, Duran, Jasiukaitis, Koopman, & Spiegel, 1996; Marmar et al., 1994).

There is substantial clinical and neurobiological evidence for the existence of a dissociative subtype of PTSD that involves emotional overmodulation and is mediated by prefrontal inhibition of the limbic system (Lanius et al., 2010). In contrast, the more common PTSD subtype is marked by reexperiencing and hyperarousal symptoms, and is thought to involve emotional undermodulation mediated by a failure of the prefrontal cortex to inhibit limbic regions.

Despite the dramatically elevated rates of past trauma in PLH, no studies to date have investigated the relationship between dissociative disorders (or dissociative symptoms) and antiretroviral adherence in HIV-positive individuals. Therefore, this study examined the relationships between PTSD symptoms, dissociation and antiretroviral adherence among adults with HIV/AIDS. Specifically, we hypothesized that PTSD and dissociation would be associated with lower antiretroviral adherence, and that dissociation would moderate the relationship between PTSD and nonadherence.

Methods

Procedure

Forty-three individuals with HIV were recruited from community-based clinics in the San Francisco Bay Area to participate in a cross-sectional, audio computer-assisted self interview (ACASI) survey examining the relationships of trauma symptoms, particularly PTSD and dissociation, to antiretroviral medication adherence. While some of these individuals were recruited either through advertising or their HIV health care providers, the majority were recruited from a larger Bay Area study of the effects of a group therapy intervention to reduce trauma-induced stress and high-risk behaviors in HIV-positive individuals. The participants recruited for our study were ineligible for the group therapy study because they did not meet the larger study's inclusion criteria of HIV transmission risk behavior. The current study did not have HIV transmission risk behavior as an inclusion criterion and thus we were able to enroll them. Participants were primarily male, ethnically diverse, predominantly low-income and unemployed (see Table 1 for descriptive characteristics of the sample). Inclusion criteria were as follows: 18 years or older, English-speaking, HIV-positive, and currently in treatment with a health care provider who had prescribed antiretroviral medications for HIV.

Participants were given an overview of the study; after complete description of the study, written informed consent was obtained from each participant. The ACASI survey took approximately 45 minutes to complete. Participants answered the computerized questionnaire individually and in a private setting, with a trained interviewer present for assistance if needed. Participants were paid $20 after completing the survey, plus the cost of transportation to the assessment site.

Each participant completed measures assessing demographic characteristics, medication adherence (Modified ACTG), distress regarding stressful events (Impact of Events Scale-Revised; IES-R), depression (Center for Epidemiologic Studies-Depression Scale) and dissociative symptoms (Dissociative Experiences Scale-II). All aspects of the study were approved by the Stanford University Institutional Review Board.

Measures

Demographics—The following demographic and substance use information was assessed: age, ethnicity, education level, relationship status, employment status, income, living arrangements and alcohol/recreational drug use.

Antiretroviral Adherence—Information regarding antiretroviral adherence was obtained using two items. The first item was the following question taken from the AIDS Clinical Trial Group (ACTG) Adherence Questionnaire (Chesney et al., 2000): *"Most anti-HIV medications need to be taken on a schedule, such as '2 times a day' or '3 times a day' or 'every 8 hours'. How closely did you follow your specific schedule over the last four days?"* Response options for this item were "*Never*," "*Some of the time*," "*About half of the time*," "*Most of the time*," "*All of the time*" and "*Refuse to answer*." Patients who answered this question by selecting the option, *"All of the time"* and who also responded to the question, *"Did you miss any doses of HIV medication during the past four days?"* by answering *"No"* instead of "*Yes*" or "*Refuse to answer*" were classified as "adherent." All other patients were classified as "nonadherent." Patients also listed the names of specific medications they were taking as part of the ACTG questionnaire, thus allowing for evaluation of antidepressant use in the sample.

Traumatic Experiences—The Revised Impact of Events Scale (IES-R) was used to assess trauma-related symptoms (Weiss, 2007). It is a 22-item survey with each item rated on a 5-point scale ranging from 0 ("not at all") to 4 ("extremely"), yielding an overall score that ranges from 0 to 88. The cut-off score indicative of PTSD is 33 (Creamer, Bell, & Failla, 2003). The scale has good test-retest reliability, good split-half reliability, and good construct validity (Weiss, 2007). The IES-R demonstrated good reliability in the current study, $\alpha = .94$.

Dissociative Experiences—The Dissociative Experiences Scale-II (DES-II) (Carlson, 1993) is a 28-item questionnaire that was used to quantify dissociative experiences. The DES-II total score is the mean of all item scores and ranges from 0 to 100. The scale is notable for its good test-retest reliability, good construct validity, and good criterion-related validity (Bernstein & Putnam, 1986; Carlson et al., 1993). The DES-II demonstrated good reliability in the current study, $\alpha = .94$.

Depressive Symptoms—Depressive symptoms were measured with the Center for Epidemiologic Studies–Depression Scale (Radloff, 1977), which consists of 20 items assessing mood, somatic symptoms, and interpersonal relationships during the past 7 days on a 4-point scale based on frequency of occurrence, ranging from 0 (*rarely or none of the time [less than one day])* to 3 (*most or all of the time [5 to 7 days]*). Following the

recommendation of Kalichman et al. (Kalichman, Rompa, & Cage, 2000), we looked only at those items measuring the cognitive and affective symptoms of depression, as somatic symptoms tend to be highly correlated with HIV symptoms and may lead to inflated diagnoses of depression among individuals living with HIV. This cognitive-affective subscale ranged from 0 to 31 in the current sample. A cut-off score of 16 or greater is indicative of depression (Weissman et al., 1977). The CES-D cognitive-affective subscale demonstrated good reliability in the current study, $\alpha = .83$.

Data Analysis

Predictor variables (dissociative experiences and posttraumatic stress) were analyzed as continuous variables. Antiretroviral adherence was dichotomized: patients who answered that in the last 4 days they followed their HIV medication schedule "*All of the time*" and also answered that they did not miss any doses of their HIV medication during the past 4 days were classified as "adherent" and coded "1." All other subjects who completed the survey were classified as "nonadherent" and coded "0."

Dissociation scores were positively skewed and therefore a square root transformation was performed on DES-II scores. The relationship of trauma symptoms, dissociative symptoms, and their interaction to the probability of HIV medication adherence was assessed using a hierarchical binary logistic regression analysis (Aiken & West, 1991). In the first block of the model, we entered participants' scores on the CES-D cognitive-affective scale to control for any effect of depression symptoms on medication adherence. In the second block, we entered centered scores for both trauma symptoms and dissociation. In the third block, we entered interaction of trauma symptoms and dissociation to assess any moderating relationships between the variables. As a post hoc analysis, we parsed moderating relationships to clarify the nature of the interaction by using a median split on the moderating variable. All statistical analyses were performed using SPSS 17.0 (SPSS Inc., Chicago, IL).

Results

Participant characteristics

Of the 43 participants who were surveyed, 38 subjects provided sufficient information to determine factors related to HIV antiretroviral adherence. A total of 32 of these subjects were males and 6 were females.

A total of 57.9% of the subjects (n=22) reported that, in the four days preceding assessment, they followed their HIV medication schedule all of the time and did not miss any HIV medication doses. These participants were classified as "adherent", and the remaining 42.1% (n=16) of subjects were classified as "nonadherent."

Prevalence of trauma, depression and dissociation

Overall, 44.7% (n = 17) of the sample screened positive for PTSD and 31.6% (n = 12) screened positive for depression, (21.0%, n = 8) reported co-morbid PTSD and depression. A total of 46.7% (n = 8) of participants who screened positive for PTSD reported antidepressant use. Half (50.0%, n = 6) of those screening positive for depression reported antidepressant use. For those screening positive for both PTSD and depression, 50.0% (n = 4) reported antidepressant use.

With regards to dissociation, 15.8% (n = 6) of the sample met threshold criteria for clinically significant dissociation according the DES-II, based on a cut-off score of 30 previously validated for screening of problematic dissociation (Carlson et al., 1993). Among those who

met criteria for PTSD, 17.6%, (n=3) also met criteria for clinically significant dissociation. An examination of specific clusters of dissociative symptoms found that 15.8% (n = 6) of the sample reported experiencing amnestic symptoms, 23.7% (n = 9) reported experiencing symptoms of absorption, and 10.5% (n = 4) reported experiencing symptoms of depersonalization. See Table 2 for descriptive statistics of and correlations between variables of interest to the current study.

Predicting variance in HIV medication adherence

Given the high correlation between predictor variables (i.e., PTSD symptoms, dissociative symptoms), we centered all continuous predictor variables around their means before entering them into the regression model in order to reduce multicollinearity (Kraemer & Blasey, 2004).

In Block 1 of the logistic regression model, the relationship between depression and medication adherence was non-significant (OR = .98, $p > .05$) and the overall model was non-significant. In Block 2, the relationship between posttraumatic stress symptoms and medication adherence was significant such that greater PTSD symptoms were significantly associated with lower odds of HIV medication adherence (OR = .92, $p < .05$), though the overall model remained non-significant. In Block 3, when the interaction term entered the model, dissociative symptoms significantly moderated the effect of PTSD symptoms on medication adherence, resulting in lower odds of HIV medication adherence (OR = .95, $p < .05$). The overall model including the moderation of PTSD symptoms by dissociation was significant (Nagelkerke $R^2 = .35$, $\chi^2 = 11.27$, $p < .05$).

Given the significant moderating relationship found in Block 3, we parsed dissociation symptom scores into high and low categories based on a median split to better characterize the interaction. Posttraumatic stress symptoms were significantly associated with lower odds of medication adherence in individuals reporting high levels of dissociative symptoms (OR = .86, $p < .05$) but not in those reporting low levels of dissociative symptoms (OR = 1.02, $p > .05$). See Figure 1 for a graphical depiction of the moderation.

Discussion

This study represents an initial examination of the relationship between PTSD, dissociative symptoms, and antiretroviral adherence among persons living with HIV/AIDS. The presence of PTSD symptoms was significantly associated with a decreased probability of HIV medication adherence, and this relationship was moderated by dissociative symptoms. Participants with high levels of dissociation showed a significant association between PTSD symptoms and lower odds of HIV medication adherence, whereas those with low levels of dissociation had no association between PTSD symptoms and adherence. To our knowledge, this is the first study to demonstrate that dissociation moderates the relationship between PTSD and adherence. We believe it is also the first study to demonstrate a relationship between dissociation and medication adherence in persons living with HIV/AIDS, or in any other patient population. A subsample of individuals who met criteria for PTSD also screened positive for clinically significant dissociation, which is consistent with the existence of a less common dissociative subtype of PTSD that is thought to involve emotional overmodulation via inhibition of limbic regions of the brain by the medial prefrontal cortex (Lanius et al., 2010). The fact that not all subjects who screened positive for PTSD also met criteria for a dissociative disorder is consistent with findings in a study showing that subjects with PTSD who also met criteria for disorders of extreme stress not otherwise specified (a diagnosis that reflects repeated traumatizations over multiple developmental stages) had greater dissociative symptomatology than subjects with PTSD alone (Zucker, Spinazzola, Blaustein, & van der Kolk, 2006).

Moreover, not all of the participants who screened positive for a dissociative disorder met criteria for PTSD. This is consistent with evidence suggesting that victims of early onset interpersonal violence who had ceased to meet criteria for PTSD still continued to exhibit symptoms of dissociation (van der Kolk et al., 1996). Thus, the experience of greater dissociation later in life, even in the absence of clinically significant PTSD, may be a hallmark of earlier psychological trauma (Bremner, 1999). It has not always been clear in previous studies if comorbid depression was in fact mediating the relationship between PTSD and adherence (Boarts et al., 2006; Delahanty et al., 2004; Sledjeski et al., 2005; Vranceanu et al., 2008). In the current study, PTSD symptoms remained a significant predictor of non-adherence even after controlling for depression.

We found evidence that PLH with depression may not be receiving adequate treatment for their psychiatric symptoms. For instance, half of the participants with clinical depression reported no current treatment with antidepressants. It is also concerning that approximately half of the subjects screening positive for depression are meeting these criteria despite already being on antidepressant therapy: nonadherence to, underdosing of, and resistance or partial responses to antidepressants are all possible explanations for this. Given the compelling evidence that depression is associated with disease progression among PLH (Leserman, 2008), it is critically important for practitioners to assess and treat depressive symptoms. Indeed, adherence to an antidepressant treatment regimen (Horberg et al., 2008) in conjunction with psychotherapy may be an effective way to enhance HIV medication adherence.

Limitations of this study include the use of self-reported medication adherence data, which can involve recall bias and be less accurate than electronic medication monitoring or pill counting strategies; however, ACASI was used to minimize response bias by enhancing reliable self report related to sensitive topics that typically pull for social desirability bias (Gribble, 1999; Tourangeau R, 1996). Moreover, while our study yielded a significant novel finding regarding the relationship of PTSD and dissociation to adherence that is consistent with the existing relevant literature, our sample size may not fully account for the variability observed in the general population of persons living with HIV/AIDS. Subsequent research needs to be conducted to replicate our findings with larger diverse samples and examine demographic and disease-related variables that may be associated with adherence and trauma, such as age, sex, and severity of HIV disease.

It is important to note that the rate of PTSD in our study sample (44.7%, n=17) was predictably higher than the 35%–36% prevalence found among PLH in other studies (Kelly, Otto-Salaj et al. 1998; Kimerling, Armistead, & Forehand, 1999a; Kimerling et al., 1999b). This was because most of our participants were recruited after they had been excluded from a separate study examining the effects of a group intervention to reduce trauma-induced stress and HIV-related risk behaviors. The prevalence for either clinical or subclinical PTSD in the recruitment sample for the group therapy intervention trial is approximately 90%, thus the vast majority of ineligible participants were not excluded from that trial based on a lack of PTSD symptoms, but rather because these individuals were not engaging in HIV-related risk behavior. Although we were targeting HIV-positive individuals with self-reported stress, our sample consists of individuals who are interested in participating in research and thus may not generalize to other HIV/AIDS populations. An additional limitation is that the study design did not allow us to determine whether the participants' PTSD and dissociative symptoms were because of their HIV diagnosis or related to other traumatic experiences (Boarts, Buckley-Fischer, Armelie, Bogart, & Delahanty, 2009) that may have occurred either before or since the time of HIV diagnosis.

Despite the limitations, our findings have implications for the clinical management of PLH who report trauma-related symptoms, which include PTSD and dissociation. Our findings suggest that there is an important need to conduct screening and assessment of PTSD, dissociation, and depressive symptoms among PLH. Moreover, therapies that reduce trauma symptoms, including dissociative symptoms, are likely to significantly enhance adherence to HIV medications. There is substantial evidence for the effectiveness of cognitive-behavioral strategies in decreasing reactivity to stressful stimuli by increasing emotional regulation and developing adaptive coping behaviors to deal with triggers that result in PTSD or dissociative symptoms (Gore-Felton, 1999a).

Moreover, exposure-based therapy has demonstrated efficacy in the treatment of PTSD (Foa, 1997). This treatment involves repetitive exposure to stimuli associated with the original trauma in order to facilitate emotional reengagement with trauma-related memories, reduce avoidance symptoms, improve affective regulation, and increase cognitive processing of past traumatic experiences, thereby reducing intrusive thoughts and hyperarousal symptoms (Foa & Kozak, 1986; Nemeroff et al., 2006).

When PTSD occurs in conjunction with dissociative symptomatology, exposure therapy may have decreased effectiveness because of the individual's reduced capacity to engage emotionally with trauma-associated memories (Jaycox, Foa, & Morral, 1998). Among individuals with borderline personality disorder, dissociative states have been shown to inhibit emotional, amygdala-based learning during classical conditioning by alteration of acquisition and extinction processes (Ebner-Priemer et al., 2009), and greater dissociation in this population has been related to poorer psychotherapy outcomes (Ball & Links, 2009). Taken altogether, dissociation often complicates PTSD treatment. Given our finding that dissociation moderates the relationship between PTSD and adherence, phase-based treatment, consisting of initial skills training in affective and interpersonal regulation, with subsequent coping skills to deal with triggers that activate dissociative symptoms, may enhance healthy behaviors for HIV disease management and prove to be the treatment of choice for targeting non-adherence in PLH with histories of trauma.

More research is needed that focuses on the development of effective clinical interventions that assess and target dissociative symptomatology to optimize medication adherence in the context of psychological trauma. Further research into individually-targeted strategies and psychological interventions that maximize adherence is critical for achieving optimal long-term health outcomes among PLH. As individuals with HIV and co-morbid trauma are living longer, medication adherence has important public health implications related to HIV resistance which, in turn, is associated with morbidity and mortality. Indeed, integrating mental health services into the medical management of HIV disease is likely to be an effective strategy in managing the complications of chronic, life-threatening disease.

Acknowledgments

Role of Funding Sources

This research was supported in part by the Stanford University School of Medicine Medical Scholars Research Program (PI: Alex Keuroghlian, MD; Faculty Research Advisor: Cheryl Gore-Felton, PhD) and the National Institute of Mental Health (NIMH) grant # R01MH072386 (PI: Cheryl Gore-Felton, PhD). Both sources of funding had no further role in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the paper for publication.

We would like to thank the patients who participated in this study. We thank Susan Sharp for recommendations related to the audio computer-assisted self interview. We also thank Evelyn Nelson, Anna Hinohara and Amy Frohnmayer who kindly assisted with the recruitment and assessment of participants.

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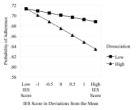

Figure 1.
Graph of Interaction Effect of Dissociation and PTSD Symptoms on Medication Adherence

Table 1

Summary of Demographic Characteristics (N = 38).

Variable	***M (SD)***	***Range***	**%**
Age in Years	45.8 (7.4)	30–60	
Variable	*N*		%
Race/Ethnicity			
African-American	8		21.1
Latino	10		26.3
Caucasian	14		36.8
Other	6		15.8
Unemployed	28		73.7
Income			
Under $20,000	34		89.5
$20,000 or over	4		10.5
Education			
High School or higher	34		89.5
College or higher	8		21.1
In a Relationship	18		47.3
In a Sexual Relationship but not Living with Partner	10		26.3
Living Monogamously with Partner	5		13.2
Married or Living as Married	3		7.9

Table 2

Bivariate correlations between adherence, PTSD, dissociative symptoms, and depression, with means (standard deviations) on the diagonal (N = 38).

	1.	2.	3.	4.
1. Adherence	*24.18 (13.11)*			
2. Dissociation	−.115	*20.58 (11.64)*		
3. Impact of Events Scale - Revised: Score	−.342*	.305*	*31.61 (17.10)*	
4. CESD Cognitive-Affective scale	−.112	.387*	.506**	*11.39 (6.58)*

Note:

* $p < .05$,

** $p < .01$

Table 3

Hierarchical binary logistic regression predicting variance in medication adherence from depression, PTSD symptoms, and dissociation (N = 38).

Variable	OR (95% CI)	OR (95% CI)	OR (95% CI)
Block 1: χ^2 = .48			
Depression	.98 (.92 – 1.04)	1.02 (.94 – 1.11)	1.04 (.89 – 1.21)
Block 2: χ^2 = 4.63			
PTSD		.95* (.89 – .99)	.92* (.85 – .99)
Dissociation		1.12 (.65 – 1.91)	.88 (.45 – 1.70)
Block 3: χ^2 = 6.16*			
PTSD × Dissociation			.95* (.91 – .99)

Notes. Model χ^2 = 11.27, Nagelkerke R^2 = .35;

* $p < .05$. Blocks were entered sequentially in the order shown in the table.